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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Before the Board of Patent Appeals and Interferences

In re Patent Application of

LINDQVIST et al.

Serial No. 09/584,796

Filed: June 1, 2000

Title: A FREQUENCY DOMAIN ECHO CANCELLER



Atty Dkt. 1410-679

C# M#

TC/A.U.: 2643

Examiner: Jamal, Alexander

Date: November 9, 2005

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

Correspondence Address Indication Form Attached.

NOTICE OF APPEAL

Applicant hereby **appeals** to the Board of Patent Appeals and Interferences from the last decision of the Examiner twice/finally rejecting \$500.00 (1401)/\$250.00 (2401) \$ 500.00 applicant's claim(s).

- An appeal **BRIEF** is attached in the pending appeal of the above-identified application \$500.00 (1402)/\$250.00 (2402) \$
- Credit for fees paid in prior appeal without decision on merits -\$ ()
- A reply brief is attached in triplicate under Rule 41.41 (no fee)

Pre-Appeal Brief Request for Review form attached.

Petition is hereby made to extend the current due date so as to cover the filing date of this paper and attachment(s)
One Month Extension \$120.00 (1251)/\$60.00 (2251)
Two Month Extensions \$450.00 (1252)/\$225.00 (2252)
Three Month Extensions \$1020.00 (1253)/\$510.00 (2253)
Four Month Extensions \$1590.00 (1254)/\$795.00 (2254) \$

"Small entity" statement attached.

Less month extension previously paid on

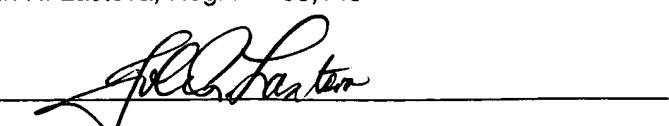
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TOTAL FEE ENCLOSED \$ 500.00

Any future submission requiring an extension of time is hereby stated to include a petition for such time extension. The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our **Account No. 14-1140**. A duplicate copy of this sheet is attached.

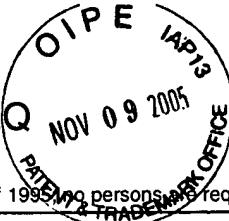
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Docket Number (Optional)

1410-679

PRE-APPEAL BRIEF REQUEST FOR REVIEW

| | | |
|----------|----------------------|--------------|
| | Application Number | Filed |
| | 09/584,796 | June 1, 2000 |
| | First Named Inventor | |
| | LINDQVIST | |
| Art Unit | Examiner | |
| 2643 | Jamal, Alexander | |

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reason(s) stated on the attached sheet(s).

Note: No more than five (5) pages may be provided.



Signature

I am the

Applicant/Inventor

Assignee of record of the entire interest. See 37 C.F.R. § 3.71. Statement under 37 C.F.R. § 3.73(b) is enclosed. (Form PTO/SB/96)

Attorney or agent of record 33,149
(Reg. No.)

John R. Lastova

Typed or printed name

703-816-4025

Requester's telephone number

Attorney or agent acting under 37 CFR 1.34.
Registration number if acting under 37 C.F.R. § 1,34 _____

November 9, 2005

Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.*

*Total of 1 form/s are submitted.

This collection of information is required by 35 U.S.C. 132. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11, 1.14 and 41.6. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and selection option 2.



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

LINDQVIST et al.

Atty. Ref.: 1410-679; Confirmation No. 4990

Appl. No. 09/584,796

TC/A.U. 2643

Filed: June 1, 2000

Examiner: Jamal, Alexander

For: A FREQUENCY DOMAIN ECHO CANCELLER

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November 9, 2005

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STATEMENT OF ARGUMENTS IN SUPPORT OF
PRE-APPEAL BRIEF REQUEST FOR REVIEW OF THE REJECTIONS BASED ON
HO OR CHAFFEE COMBINED WITH DOWLING

The independent claims (except claims 20 and 30 dealt with later) recite "estimat[ing] in the frequency domain an echo signal" and "remov[ing] in the frequency domain the estimated echo signal in the frequency domain from a received signal in the frequency domain." Chaffee disclose an echo canceller in which the estimated echo is converted to the time-domain and subtracted from the received signal. Ho relies primarily on echo cancellation in the time domain. See lines 10-13 of col. 6: "*After the adder 52 subtracts the time-domain portion of the echo, e(n), the output is converted by a serial-to-parallel (S/P) converter 54 into a block of N real-valued time-domain samples.*" Then a residual echo is converted from the time to the frequency domain so that a residual echo E(f) is removed. Hence, *the main echo is removed in the time-domain*, and then the result is corrected in frequency-domain. The reason Ho takes this approach

is that Ho does not (and can not) remove the echo due to a previous symbol in the frequency domain.

The Examiner admits that Ho and Chaffee lack estimating the echo signals in the frequency domain using a combination of (i) a product of a first matrix of coefficients in the frequency domain and a transmitted symbol and (ii) a product of a second matrix of coefficients in the frequency domain and a previously-transmitted symbol. The Examiner relies on Dowling to remedy their deficiencies. That reliance is misplaced.

Dowling describes a pre-equalizer—not an echo canceller. Dowling *precodes* a signal *before* the signal is transmitted in order to compensate for transmission channel distortion (not echo) that would otherwise distort the signal received at the intended receiver (i.e., the far-end transceiver). The hope is that this precoded signal will be received without the receiver having to equalize the signal. In other words, Dowling tries to compensate for the channel distortion before transmission so that the signal is received more or less undistorted by the channel. Dowling is concerned about the far-end receiver and the received signal.

In contrast, the claimed echo cancellation is at the near-end transceiver, and the echo that the near-end transceiver must deal with is reflected back to the near-end transceiver. These basic facts would be well understood by those skilled in echo cancellation. While Dowling effectively pre-equalizes (precodes) the transmitted signal for the transmission channel in order to simplify signal processing in the far-end transceiver, the instant claims remove echo in the near-end transceiver caused by the near-end transmitted signal. These are two very different problems.

Compensating For Channel Distortion Does Not Compensate For Echo. Dowling's precoder does not estimate and remove an echo signal from a received signal—let alone do this in the frequency domain. Rather, Dowling estimates and "removes" the expected transmission

channel distortion from the transmitted signal so that distortion introduced by the transmission channel will be minimized at the receiver. Dowling's channel distortion estimate *does not include echo cancellation*. Echo is caused by transmission line impedance mismatches, which is different from the channel transfer function. Echo is experienced at the near-end transmitter, and not at the far-end receiver, which is where Dowling's precoding goal is. Why would Dowling model/estimate an echo that is not part of the channel distortion of the signal received at the far end receiver? Echo is a problem for the near-end transceiver to deal with and not the far-end transceiver.

The Examiner relies on col. 22, lines 1-3, where Dowling states that "communication systems often involve other elements such as echo cancellers which may be advantageously merged with the precoder." But here *Dowling admits that his precoder/pre-equalizer does not perform echo cancellation*. If you want to cancel echo, Dowling explicitly states that you need to use an echo canceller because his precoder will not. Thus, the Examiner's premise that Dowling's precoder somehow removes the echo from the transmitted signal cannot stand.

The Ho/Chaffee/Dowling Combinations Fall Short. Even if Dowling's precoder were "merged" with Ho's or Chaffee's echo canceller, one would not arrive at the claimed echo cancellation. Dowling's precoder, by Dowling's own admission, does not perform echo cancellation. Hence, in the Examiner's proposed combination, it is just Ho's echo canceller doing the echo cancellation, which the Examiner rightly admits is not the claimed echo cancellation. So the proposed combination fails.

To cancel echo (which is not transmitted over the transmission channel), a model of the echo is needed; a model of the transmission channel is not. On the other hand, Dowling's precoding modifies the transmitted signal using an inversion of the transmission channel transfer

function. The hoped for result is the receiver gets a signal that is more or less unaffected by the channel transfer function. But only knowledge of the transmission channel is needed and not the echo experienced at the near-end. And because the echo is removed from the transmitted signal in the merged combination, its not part of the transmitted signal—nor is it part of the channel.

The Ho/Chaffee/Dowling Combinations Would Not Be Made. Notwithstanding the significant deficiencies already noted, assume for the sake of argument that there were some provision by Dowling to precode the signal to be transmitted for echo cancellation—which Dowling plainly does not do—along with precoding for the transmission channel. The echo would be modeled and then inverted (call this X) just like the transmission channel is modeled and inverted (call this Y). But the consequence is that the inverted echo model X negatively affects the inverted channel model Y resulting in distorting the received signal even more at the far-end receiver! That is why this modification would not be made. Further distorting of the signal at the far-end receiver and the need for more sophisticated equalization at the far-end receiver are the very things Dowling is trying to avoid. The Federal Circuit has clearly stated that a proposed modification that renders a reference inoperable for its intended purpose is an inappropriate foundation for an obviousness rejection. *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984).

Consider the alternative combination where Dowling's precoded signal is directly applied to the input of Ho's echo canceller. In that case, that applied signal is still only compensated for transmission channel ISI and ICI. The echo ISI and ICI would not be compensated for, but instead would be additionally distorted. Accordingly, Ho's echo canceller cannot be combined with Dowling's precoder in the manner proposed by the Examiner to result in the claimed echo canceller. Such a proposed combination certainly does not result in estimating a echo signal in

the frequency domain using the claimed combination of first and second matrices using by a transmitted symbol and a previously-transmitted symbol.

Ho And Dowling Do Not Compensate for Echo ICI or ISI. The frequency domain echo canceler in claim 30 "estimate[s] the echo in the received signal using *a frequency domain model of an echo path channel that includes effects of intersymbol interference and inter-carrier interference and to subtract the echo estimate from the received signal* to provide a difference." See also claims 20 and 21. None of the applied references teach an echo canceller that takes into account effects of echo inter-carrier interference (ICI) and inter-symbol interference (ISI) in a frequency domain model in an echo estimate so that it can be subtracted out from the received echo at the transmitter.

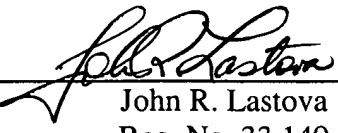
The Examiner assumes that ICI is a form of either ISI or noise. To the contrary, as explained in the background of this application, ICI is not the same as ISI. Nor is ICI a form of "noise." Two articles previously provided to the Examiner demonstrate this fact.

A fundamental point ignored by the Examiner is that the ISI and ICI in the transmitted signal are not the same as the ISI and ICI in the echo. None of the applied references model or compensate for the echo ISI and echo ICI.

Respectfully submitted,

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